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ABSTRACT

There is much confusion about the new emerging technology called multimedia. Some experts call it the next revolution in computing. Still others in the computer field feel that this technology is just a lot of hype with new buzz words that will fade away in time. This paper reviews the origins of multimedia technology and provides a clear definition of what multimedia is. Computer platforms and the necessary peripherals used for multimedia are discussed. In addition, interactive multimedia authoring tools are reviewed, and the future of this emerging technology is explored. The future will depend on the operating system environment that developers choose. Anyone who wants to experiment with this technology should stay with the Windows environment. It is hoped that the Multimedia PC Marketing Council will set standards for full motion video. (Contains 14 references.) (SLD)

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TITLE: A GUIDE TO INTERACTIVE MULTIMEDIA TECHNOLOGY

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ABSTRACT

There is much confusion about the new emerging technology called multimedia. Some experts call it the next revolution in computing. Still others in the computer field feel that this technology is just a lot of hype with new buzz words that will fade away in time. This paper will review the origins of multimedia technology along with a clear definition about what multimedia is. Also, computer platforms along with the necessary peripherals used for multimedia will be discussed. In addition, interactive multimedia authoring tools will be reviewed. Finally, a future look at this emerging technology will be explored.

A GUIDE TO INTERACTIVE MULTIMEDIA TECHNOLOGY

I. Interactive Multimedia Overview

A. Interactive Multimedia defined.

"Now, five hundred years after Gutenberg, fifty years into the television age, and forty years after the introduction of the computer, we finally have-in one tool-the intellectual content of print, the images of video, the sensory impact of sound, and the speed of electronics."- David Z. Shefrin, President of Interactive Video Industry Association

This quote by David Z. Shefrin, truly reveals the power that this new emerging technology called multimedia has as a communications tool. No one really knows for sure when this emerging technology will affect businesses or education but there is enough evidence now to prove that this technology will be an effective communications tool.

What makes interactive multimedia technology an instant success as a communication tool is the fact that the user of the multimedia program uses all of their senses to explore the presentation. Sight is used to see the colorful display or animation; sound is used to hear digitized music or auditory narrative; touch is used to activate the mouse or touch screen display.

Multimedia applications helps learners retain more information and users participate in their learning process. Learners can retain about 20 percent of what they hear, about 40 percent of what they hear and see, and about 75 percent of what they hear, see, and do.

The Houghton Mifflin dictionary defines multimedia as follows: "Including, or involving the use of several media." By definition, interactive multimedia is a presentation or program that involves the use of multiple media data types such as audio, video, graphics, text and images. Multimedia typically involves different media sources such as CD-ROM, videodisc, operating under computer control.

B. Early History of interactive multimedia technology.

Historians have discovered that as far back as 3100 BC writings were found on cave walls as an early form of communication. Throughout the years, there have been many multimedia inventions such as the printing press and the television set that made drastic improvements in the way which we communicate and get information.

Visionaries such as Vannevar Bush back in 1945 in a classic article that appeared in THE ATLANTIC MONTHLY titled "As We May Think" suggested that there would be a tool that would enhance human memory and thinking and that would allow people to retrieve information from a computer in many of the same ways in which retrieval is accomplished within human memory.

Ted Nelson and Doug Engelbart extended these basic ideas in the 1960's. Ted coined the term "hypertext" to suggest that, in the future, literatures will not be constrained to linear-document form, that instead they will allow the conscious flights of fancy that are possible within people's mind. Doug extended these notions, developing working models of quite extensive hypertext systems on large-scale computing systems. Contextualizing these models within his own concept of the computer as a tool for augmenting the human intellect. He provided a range of examples in which hypertext systems were used to enhance the thinking of individuals involved in collaborative work.

In 1978, Nicholas Negroponte, a scientist at MIT's Media Laboratory, predicted the fusion of the broadcast, print publishing, and computer industries as the direction of communications technology. The development of interactive multimedia began at this same time in the late 1970's with the introduction of optical disc storage devices such as the laser videodisc. Known first as laserdisc technology, then interactive video, multimedia gained sophistication in the 1980's with the introduction of CD-ROM, digital audio, and digital video devices.

IBM had their own vision of interactive multimedia technology in 1979 when the company teamed with MCA to form Disco Vision Associates, a videodisc mastering, replication, and development company that was a leading force in Level II videodisc technology. Although this venture was not a

success, the operation was sold to Pioneer in 1982.

IBM had two individuals who wanted to merge the personal computer and videodisc technology. Phil Smith and Doug Winter were responsible for convincing management to fund a project to accomplish this task. After several years of beta testing, the product called Vision at that time, enabled developers to produce touchscreen interactive video programs controlled by a PC. In 1986, Vision became a product named InfoWindow.

The InfoWindow display, which weighed more than 40 pounds had a larger footprint than today's series of monitors. The display head weighed so much because it was loaded with so much technology. Packed inside the sturdy, plastic housing was a stable, piezoelectric-class touchscreen that provided a much cleaner image than any of the competing membrane touchscreens. In addition, the display contained a microprocessor that controlled the videodisc player as well as two stereo speaker.

The success of this product happened because of the commitment that IBM had with this technology. Professional authoring software was introduced so that developers could immediately take advantage of this new technology. Soon, corporate clients were benefitting by using this new technology. Corporate training applications were created with much success.

IBM was not alone in discovering this new and emerging technology. The Commodore Amiga has long been used by video professionals and hobbyists to integrate text and graphics with animation, video and sound in 1985. The Amiga's success in the graphics and video production markets is due to its custom graphics and animation chips, which were designed to be compatible with standard video equipment. These features were built into every Amiga system from the low end to the high end.

In the late 1980's, Apple Corporation introduced a set of videodisc controller commands for HyperCard which allowed their Macintosh computer to be connected to a videodisc player. In fact, the Apple Macintosh system came with the ability to play back rich sounds and display animation. Apple insisted that it will never come out with a "multimedia computer," because, in the company's view, the

Macintosh already is and always has been a multimedia system.

The Macintosh II had high resolution color display and audio chips. HyperCard, a hypertext authoring system, was a software program that came with every Macintosh. It used the graphical user interface (GUI) that was the standard platform that came with the Mac. Hypercard was easy to use and the educational marketplace was a big one for Apple because they had control over that market at that time.

HyperCard had won rapid acceptance among developers and soon some significant interactive videodisc products were released. ABC News began producing HyperCard stacks that were designed for teachers to use with their students in the classroom. The first few disks covered the 1988 presidential campaign, the Israeli-Palestinian conflict, Martin Luther King, Jr, and the 1989 California earthquake. Each disc contained video clips, text information, and a navigation system to find video, text, or graphic data.

The success of these discs came from the fact that students or teachers who used the discs could reuse the video on the disks. A mini documentary maker came with the program which enabled students to create video reports with the discs.

In the fall of 1987, Larry Kheriaty set about making hypermedia happen on the IBM PC. He worked three months, then in March 1988 showed the results of his work to people at the IBM Educational Division in Atlanta. IBM was quite impressed and under the code name Marlin, IBM set in motion a high speed development program for what would ultimately be IBM's version of HyperCard which they called IBM Linkway. IBM Linkway was an instant success in the educational marketplace whereby elementary students through college students could create multimedia presentations with ease.

C. Brief overview of interactive multimedia application successes

The results of an Interactive Communications Technology Survey by Warren C. Weber in 1991 surely indicate that there is much success among users of multimedia technology. This survey asked numerous questions about interactive multimedia technology. Some of the results of the survey are as

follows: 1. Interactive video, or multimedia sequences tend to hold the interest of users; (4.138 surveyed agreed); 2. Graphical interactive screens are, overall, more effective than text screens;(4.057 agreed); 3. Interactive technologies do not reduce the need for a real person (teachers/trainers) or tend to take away jobs; (4.057 agreed).

Some other success include Xerox Corporation reporting that they are saving $6 million each year by training 15,000 field service technicians with interactive videodiscs. IBM reports that in a 1984 study, interactive video was about three times more effective at teaching than an instructor. Massachusetts Mutual Insurance reports cutting training time in half with the use of interactive video. Finally, a published summary of thirty research studies called "The Use and Effectiveness of Videodisc Training," by Michael DeBloois, supports the assertion that time savings can indeed range from one third to one half.

According to industry expert Rockley L. Miller who has been tracking the evolution of interactive technologies for over ten years, he remains convinced that the technology will be broadly adopted for education and training in the future. He states, "Not because they are effective, which they are. Not because they are inexpensive, which they are in proportion to other types of costs. And not because they are a panacea for all that ails the system, which they are not. They will be adopted because the problems are growing faster than any alternative solution on the horizon can deal with. Interactive technologies will be adopted because we have no other choice."

This is only the beginning, the future of interactive multimedia technology entails videotext conferencing, video faxing of images, fiber optic cables connected to our homes, and distant classroom learning via multimedia classrooms.

II. Interactive Multimedia Hardware Components

A. Hardware Platform

IBM has a family of multimedia products for users. The IBM PS/2 Ultimedia Model M57 SLC is the computer system that has all multimedia technologies built into it. For example, the standard multimedia features include an

integrated CD-ROM drive, integrated front panel with volume control, headphone and microphone jacks, advanced audio capabilities, advanced graphics (XGA) and high performance 386 cached processor. Also, the system included 4Mb of RAM, 80Mb hard drive, 2.88Mb floppy drive and three free slots and comes with DOS 5.0, Windows, and OS/2.

If full motion video is required for multimedia presentations, IBM has two full motion video cards to select. The IBM ActionMedia II is the first fully digital multimedia product offered. This card is based on DVI technology jointly developed with Intel Corporation. The features of this card includes both the capture/display and networking of high quality motion video, audio and true color still images.

The second full motion card that IBM has is the M-Motion Video Adapter/A. This technology compared to the DVI technology is now old but the card can still bring full motion video to a multimedia presentation.

For sound capabilities, IBM has the M-Audio Capture and Playback Adapter. This is an all purpose audio adapter that provides the capability to capture, digitize and play back high quality audio. However, what is missing from this card is a midi port to connect a midi keyboard to it.

To capture still pictures, IBM has the Video Capture Adapter/A card. This is an advanced board for PS/2 Micro Channel computers that allows the capturing of images from a video camera, videocassette recorder or laserdisk and converts them to a digital signal and displays them in full color in a variety of modes.

In addition to these multimedia products, IBM has a touch screen which can be used for multimedia interaction. IBM has full support services for all of their products and were involved with multimedia technology from the start.

MPC IBM Compatible

In 1991, Tandy Corporation got together several companies which manufactured multimedia products and formed a council called Multimedia PC Marketing Council. Their task was to try to standardize multimedia products which ran under Microsoft Windows 3.1 environment. These standards would be for IBM Compatible computer systems which had a 386sx microprocessor and was at least 20 MHz in speed.

The recommended hardware for an MPC should be 4Mb of RAM, 40Mb of hard disk space, Super VGA graphics monitor, CD-ROM drive with audio outputs and a transfer rate of 150k, 1.44Mb disk drive, Audio components with MIDI input and output and hardware for playback and recording of 8 bit digital sound. The computer system should have 2 slots free for expansion. The MPC operating system includes MS DOS and Windows.

The MPC also has a MPC upgrade kit for present users of 386 who want multimedia capabilities from their existing machines. This kit includes a CD-ROM player, Sound Blaster Pro audio card, speakers, and several CD disks. To date, the MPC Council has not standardized full motion video.

Apple Macintosh

Apple was one of the early pioneers in the area of multimedia and the HyperCard authoring software helped a great deal in the company's success. In addition, Apple has developed Quick Time, a system level time and motion manager. Quick time provides a rapid compression/ decompression on the fly, relieving the overhead on RAM.

The Apple Macintosh Plus or SE is a popular Macintosh used for multimedia. It comes with Hypercard software, a monitor, hard disk drive and built in speakers for sound. Several peripherals can be purchased for still video, full motion video, video disk and CD-ROM. Soon, the Macintosh will have a built in CD-ROM player.

The Mac IIfx is considered to be the fastest Macintosh with a 8.24 GC graphics coprocessor with 24 bit images.

Apple has it's own scanner, MacVision video digitizer, and MacRecorder for sound digitizing.

B. Peripherals Needed for Interactive Multimedia

Audio

A sound card, amplified speakers and a microphone is what is needed to record sound into a multimedia presentation. A sound card can be purchased individually or it can be purchased with a multimedia upgrade kit that was created by the MPC council.

The 16 bit sound card is the standard card because of the quality of sound that comes from the card. Every sound card should be able to play back waveform (.WAV) files which is also getting to be the standard sound file because this is the sound file that Windows operating system will play back.

The Sound Blaster Pro by Creative Labs is the largest selling sound card because of its low price and compatibility with several multimedia authoring programs.

Amplified speakers is what is needed to hear sound in a multimedia presentation. There is a wide variety of speakers to choose from and testing the speakers for one's needs is a requirement.

Finally, a microphone is needed to record sound files. A good Radio Shack microphone is all that one needs to accomplish this task.

CD-ROM

CD-ROM technology can be used two ways in a multimedia presentation. First, stored pictures on a CD disc could be used in a presentation. Second, the CD-ROM audio could be used for music in a multimedia presentation.

The CD-ROM Drive can be either built in to the computer system or it can be external. The external drive requires an SCSI interface card connected to a free expansion slot inside the computer system. The minimum transfer rate should be 150K/second and access time should be under one second. However the faster the drive the better. CD-ROM technology has improved very rapidly and multimedia users can now save hard disk space and store multimedia files on

CD-ROM. In fact, several software companies like Lotus Development Corporation and CorelDraw are now coming out with their software on a CD-ROM disc.

The CD-ROM XA has been the standard player for Sony, Microsoft, and Philips. This drive will run an any platform with the correct software and hardware interface.

The CD-ROM market is growing quite rapidly because of the MPC Council requiring a CD-ROM Drive to be used in multimedia. Also, there are several hundred CD discs that can be used in business, education, or entertainment. For example, Microsoft Bookshelf contains seven popular reference volumes on one disc such as The American Heritage Dictionary, The Concise Columbia Encyclopedia, Bartlett's Familiar Quotations, The Concise Columbia Dictionary of Quotations, Roget's II: The New Thesaurus, The World Almanac and Book of Facts, and the Hammond Atlas of the World. This disc contains text, graphics, audio and animation. This disc is quite popular because several companies are bundling this disc with a multimedia upgrade kit.

A new development in CD-ROM technology appeared recently with the announcement of the Photo CD by Eastman Kodak Company. This is a new way to work with photographs. Pictures are stored on a CD-ROM disc instead of conventional negatives, prints and slides. The images can be used in multimedia applications.

Several photo outlets will now be able to develop your roll of film onto a CD disc.

Video Disc

Video disc technology was first explored in the late 1970's. As an information storage medium, the laser optical reflective video disc is revolutionary. The video disc is a high density carrier of both audio and video information. Shaped like a long playing phonograph record, it is commonly 12 inches in diameter and has a silvery, prismatic, grooveless surface that is encoded and read by a laser beam. Each side of a Constant Angular Velocity (CAV) disc can store 30 minutes of motion, video or film, or 54,000 individual frames, and each frame can contain a single picture, such as a 35-mm slide. The laser is able to locate and display and one of the 54,000 frames in 1.5 seconds ore

less, while the videodisc is spinning at the rate of 1,800 revolutions per minute.

The computer is connected to the video disc player through the serial port. Pioneer and Sony are the largest companies manufacturing a variety of video disc players.

Training and education are the key markets for video disc technology. There are several commercially available discs available or there are service bureaus who can create a video disc for someone's application.

Video Capture

Multimedia presentations are enhanced with digitized pictures. All that is needed to do this is a camera and a peripheral card designed to capture pictures. Capturing is relatively easy with the Canon Xapshot camera which is a still video camera and capturing software.

Full motion video

DVI technology is the current technology being used for full motion video in multimedia presentations. DVI technology has video compression algorithms which allows compression/decompression possible. To use multimedia applications on a network requires DVI technology. The IBM ActionMedia card is DVI and Intell Corporation manufactures their own DVI card.

What makes DVI unique is the fact that you can store full motion video on a hard disk. Full motion video has to be used judiciously because it does take up a lot of space on the hard disk even with compression.

A camcorder or video disc player is also needed to capture full motion video.

III. Interactive Multimedia Authoring Tools

IBM

The Audio Visual Connection, or AVC is a comprehensive multimedia authoring and presentation system with a broadrange of useful tools that can be used to develop sophisticated applications with powerful branching routines. The product is designed for the professional developer and not the casual user. AVC by itself is a full integrated system, with its own graphics package, image capture software, and audio editor. Full motion video can be captured with IBM's full motion video card or the actionmedia card. Sound is captured with the IBM audio card. AVC is designed to be used with the family of peripherals that is sold by IBM.

IBM Compatible

As stated earlier, the MPC Council has endorsed Microsoft Windows as the operating system for the MPC computer system. Windows has multimedia capabilities in itself because you can now record audio or full motion video and place it anywhere in a Windows product.

There are several windows based multimedia authoring programs such as Toolbook by Asymetrix Corporation that can be used. Toolbook is a high level, object oriented application construction kit. The package controls multimedia hardware using Windows with Multimedia Extensions.

Apple

In 1987, Apple introduced HyperCard for all Macintosh computer systems. HyperCard is delivered free with every Macintosh sold. HyperCard has been defined as an information manager and a full fledged object-oriented programming language with multimedia features.

HyperCard is a hypertext software program that allows users to create stacks which are related to each other. A stack can be animation, text with sound or anything the user creates. The user navigates through each stack until completion.

There are many commercial stacks that have been designed by third party companies for education and business. ABC News created several HyperCard stacks which included the 1988 Presidential Election, a stack on Martin Luther King Jr. and Hurricane Hugo.

IV Summary: Where is this technology going?

Some critics like John Gale from Information Workstation states "We have too much hype. I had thought we had too much hype in 1984 when CD-ROM was introduced, but the hype for multimedia surpasses that by far." He continues and states that "if we emphasize the business issues, multimedia won't sell successfully."

Although Gale might appear to be critical, he is concerned along with many other industry experts that standards will play an important role for the multimedia industry. Today, the multimedia industry is growing quite rapidly yet there are no formal standards for development of new products. In 1991, IBM and Apple Computer Inc. and a host of other high technology companies joined an industry group to set standards for personal computers that use sound and video.

The MPC Council has supported the Windows environment for their standards but have not committed to standardizing full motion video for multimedia usage. Ed Judge, a Tandy Corporation expert, states that "the MPC represents a minimum standard, not a closed end platform and more advanced technologies can be layered on top of it for more demanding applications." It also assures buyers that an application carrying the MPC seal will play on their computer.

Today, the media control interface which is a high level control mechanism that provides a device independent interface to multimedia devices for access by programs running under Windows is the standard agreed on by Microsoft and IBM. This is definitely a start to standardize but because of the multitude of peripherals that are used in developing multimedia products, standardization will continue to be a problem in the industry. Simply stated there are too many products and buyers must be aware of this and make sure the product will work before they buy.

According to an industry forecast, multimedia has a healthy future by 1995 there will be $13.3 billion in multimedia sales for the North American market. Video games or consumer entertainment seems to be the major part of multimedia revenues. Lucie Fjeldstad from IBM believes that the future of multimedia includes "videoconferencing which will largely replace travel in corporate budgets. People will face off against one another on real time networked video games or order up movies on demand." She continues and predicts that "people will shop from their homes and read customized magazines." Finally, she preaches that "students and business people will increase their skills by attending distant classrooms via multimedia links."

In the corporate world, Paul Mace, a long time industry expert, is convinced that by "using multimedia, the information can be processed once and presented in many forms so that anyone can, depending upon their needs and sophistication, be informed." "Information also becomes less redundant" he states.

In closing, the future of multimedia technology will depend on the operating system environment developers choose. The two choices on the IBM are either OS/2 for microchannel IBM computers or Windows. The safe bet for someone that wants to experiment with this technology is to stick with the Windows environment. The MPC Council has made a big impact on IBM compatible users. Their approval on products has given the end user a sense of satisfaction that it will work on their computer system. Hopefully in the near future, the council will set standards on full motion video.

For new users, a turn key system is nice because the multimedia hardware and software will work together. For existing users of computers, difficult decisions need to be addressed to purchase the appropriate hardware and software. The effort to learn multimedia is very rewarding and hopefully this paper will help you get started to explore the world of multimedia.

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